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IS 631 (1979): Outdoor Aluminium Foodgrain Storage Bins
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Indian Standard

SPECIFICATION FOR OUTDOOR ALUMINIUM FOODGRAIN STORAGE BINS

(First Revision)

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NEW DELHI 110002

Gr 3 *December* 1979

Indian Standard

SPECIFICATION FOR OUTDOOR ALUMINIUM FOODGRAIN STORAGE BINS

(First Revision)

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SPECIFICATION FOR OUTDOOR ALUMINIUM FOODGRAIN STORAGE BINS

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 25 May 1979, after the draft finalized by the Storage Structures and Storage Management Sectional Committee had been approved by the Agricultural and Food Products Division Council.

0.2 This standard was first published in 1961. The present revision incorporates smaller aluminium bins which are preferable under certain conditions and are based on the work done by the Indian Grain Storage Institute, Hapur.

0.3 It is recommended that the flat-bottom bins should be suitably mounted on prefabricated steel elevated base, while the hopper-bottom bins should be mounted on brick masonry column as given in Appendix A.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard prescribes the requirements of materials, dimensions, capacities and the method of construction of circular aluminium bins for bulk storage of grains at the farm level. This standard includes the flat-bottom and hopper-bottom bins made of plain aluminium sheets.

---

*Rules for rounding off numerical values (*revised*).

2. DESCRIPTION

2.1 The outdoor aluminium flat-bottom bin (*see* Fig. 1) consists of a cylindrical body and conical roof having the same diameter with variable heights so as to provide 5 different capacities. The conical roof with a slope of 25° should be made by joining 10 number of roof panels and roof stiffeners. The bin has inlet either at the centre or at the side of the roof to facilitate the filling of the bin and the outlets are provided at the bottom of the bin at the floor level. In a small capacity bin only one outlet should be provided while in the large capacity structures, two outlets diagonally located should be provided. The flat-bottom bin should be mounted on prefabricated steel elevated base as given in Appendix A.

2.2 Outdoor hopper-bottom bin (*see* Fig. 2) consists of cylindrical body, conical roof and self emptying having the hopper angle either 35° or 45° as required for different commodities of foodgrains. The hopper part of the bin carries one single outlet at the bottom which facilitates the emptying of the structure completely. This structure is mounted on brick masonry column in such a way so that the spout of the bin should be nearly 750 mm above the ground level which would facilitate to fill the bags conveniently. The details of the construction of foundation should be as shown in Appendix A.

3. CAPACITIES AND DIMENSIONS

3.1 The volumes and the dimensions of the bins are as given in Tables 1 and 2.

4. MATERIAL OF CONSTRUCTION

4.1 The bin should be constructed from the following material.

4.1.1 *Bin Wall, Roof Stiffener and Hopper* — The wall of 6·7 m^3 capacity bin should be fabricated by using 1·25 mm thick plain aluminium sheets while other small bins should be fabricated by using 1·0 mm thick sheets. The roof and roof stiffeners should be fabricated from 1·0 mm thick plain aluminium sheets. Hopper panels and hopper stiffener should be used in case of hopper-bottom bins shall be fabricated by using 1·0 mm and 1·25 mm thick aluminium sheets respectively. The aluminium sheets shall conform to IS : 733-1975*.

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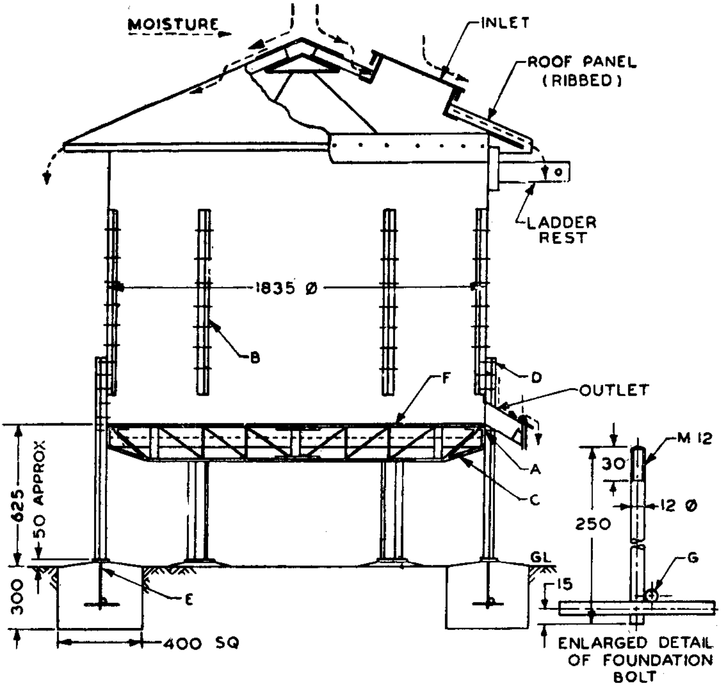
*Specification for wrought aluminium and aluminium alloy bars, rods and sections for general engineering purposes) (*second revision*).



A — Bolts M 6 ϕ × 25 mm (electrogalvanized, 36 required) (Hex headed) ,
Bolts M 6 ϕ × 20 mm (electrogalvanized, 34 required)
B — Wall stiffener
C — Support truss ring
D — Support leg
E — Foundation bolt
F — Bottom plate
G — 12 ϕ × 150 weld at 90°

All dimensions in millimetres.

FIG. 1 FLAT-BOTTOM ALUMINIUM BIN

4.1.2 *Top, Intermediate and Bottom Rings* — The top, intermediate and bottom rings should be fabricated by using 50 × 4 mm and 100 × 6 mm mild steel flat and 3 mm thick plate. The steel plates and flats shall conform to IS : 1730 (Part I)-1974* and IS : 1731-1971†.

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*Dimensions for steel plate, sheet and strip for structural and general engineering purposes: Part I Plate (*first revision*).

†Dimensions for steel flats for structural and general engineering purposes. (*first revision*).

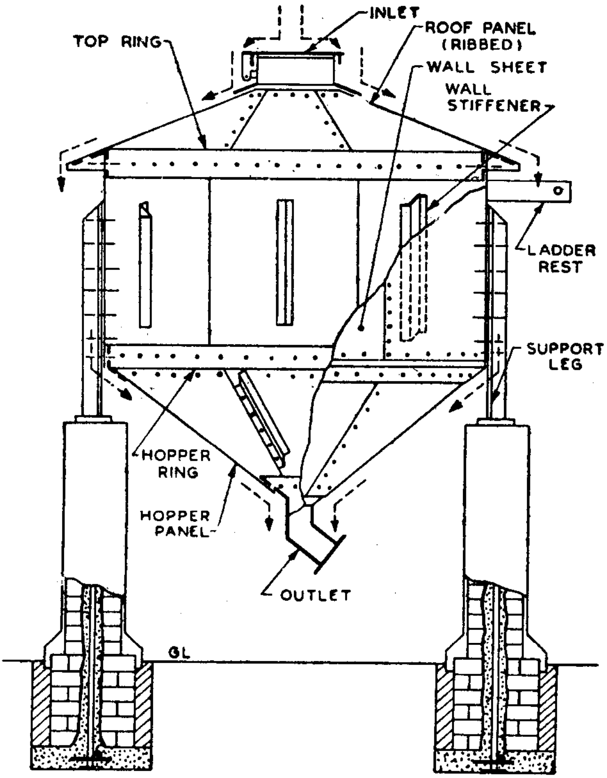

FIG. 2 HOPPER-BOTTOM **Aluminium Bin**

TABLE 1 VOLUME AND DIMENSIONS OF FLAT-BOTTOM BINS

(*Clause* 3.1)

SL No.	VOLUME IN m^3	APPROX TONNAGE			DIMENSIONS (mm)*	
		Wheat	Paddy	Maize	Bin Diameter	Height of Cylindrical Portions
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	2·7	2·0	1·5	1·9	1 835	915
ii)	3·5	2·6	1·9	2·5	,,	1 220
iii)	4·3	3·2	2·4	3·0	,,	1 525
iv)	5·1	3·8	2·8	3·6	,,	1 830
v)	6·7	5·0	3·7	4·8	,,	2 440

*Tolerance ± 3 mm.

TABLE 2 VOLUME AND DIMENSIONS OF HOPPER-BOTTOM BINS

(*Clause* 3.1)

Sl No.	Volume in m³		Approx, Tonnage						Bin Dia mm	Total Height of Bin Above Ground Level	
	35°	45°	Wheat		Paddy		Maize			35°	45°
			35°	45°	35°	45°	35°	45°			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
i)	7·3	7·5	5·4	5·6	4·0	4·1	5·5	5·35	1 835	4 340	4 630
ii)	5·7	5·9	4·2	4·15	3·15	3·25	4·05	4·20	,,	3 730	4 030
iii)	4·9	5·1	3·6	3·8	2·7	2·8	3·45	3·6	,,	3 425	3 715
iv)	4·1	4·3	3·0	3·2	2·25	2·35	2·85	3·05	,,	3 120	3 410
v)	3·3	3·5	2·4	2·6	1·8	1·9	2·3	2·5	,,	2 815	3 105

NOTE — The hopper angle of 35° shall be preferable for wheat and 45° for paddy and maize.

4.1.3 *Inlet and Outlet* — The inlet should be fabricated by using different sizes of mild steel or aluminium flat bar, round and 3 mm thick plate. The outlet should be fabricated by using different sizes of mild steel and aluminium flat and 3 mm thick plate.

4.1.4 *Wall Stiffeners* — These should be provided in the last four higher capacity structures and should be fabricated by using 1·25 mm thick aluminium sheets.

4.1.5 *Bolts, Nuts and Washers* — The aluminium or galvanized steel bolts and nuts (*see* IS : 737-1974[*] and IS : 1367-1967[†]) of different sizes should be used for joining the wall sheets, roof panels and other components of the bin. In order to make the joints completely water tight, two types of washers are recommended, the flat plain metal washers (*see* IS : 2016-1967[‡]) for inside while the fibre washers for outside.

5. FITTING AND OTHER ACCESSORIES

5.1 Outlet — A rectangular outlet of 250 × 200 mm sloping downward at an angle of 30° shall be provided at the bottom of the structure for reclamation of the grain. The outlets shall be provided with locking and sealing arrangement. Similarly an outlet of 200 mm diameter shall be provided at the bottom of the hopper in case of hopper-bottom bin 750 mm above the ground level. The outlets shall be provided with locking and sealing arrangement.

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[*] Specification for wrought aluminium and aluminium alloys, sheet and strip (for general engineering purposes) (*second revision*).

[†] Technical supply conditions for threaded fasteners (*first revision*).

[‡] Specification for plain washers (*first revision*).

5.2 Ladder Rest — A ladder rest fabricated by using different structural steel shall be provided at the top of the bin wall as shown in Fig. 1 and Fig. 2.

5.3 Sealing — In order to make the wall panel and roof panel joint completely air and water tight, the necessary groovings shall be provided in the wall and roof panels and these grooves should be filled up with cotton cord applied with white stiff paint (*Safaida*)

5.4 Painting — All the mild steel components snould be cleaned of oil and welding slag and then painted by applying the single coat of red oxide metal primer and single finishing coat of enamel paint.

5.5 Whenever the mild steel component is to be joined against aluminium component, the precaution should be taken to avoid the surface contact between the two by providing fibre sealing or painting with zinc chromate primer.

6. ASSEMBLY

6.1 The details of assembly and location of the bins are given in Appendix A for guidance.

7. CRITERIA FOR DESIGN

7.1 The bin should be designed with the consideration to grain pressure, wind loads and other safety factors.

8. PERFORMANCE TEST

8.1 In order to get satisfactory performance from the bins, the moisture content at the time of storage for different commodities should be within the safe limit [*see* IS : 6151 (Part II)-1971*].

9. PACKING AND MARKING

9.1 Packing — The storage bins shall be supplied in parts or prefabricated. The suppliers of the bins shall furnish details of erection and assembly of the bins and a copy of the guidelines for construction of platform or plinth and list of materials supplied. Fitting tools and 5 percent of the fastenings in case of fastened bins shall be supplied to the buyer.

9.2 Marking — A metal label giving the name of the supplier, the date of erection and the batch and serial number shall be attached to each bin.

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*Storage management code: Part II General care in handling and storage of agricultural produce and inputs.

9.2.1 Each bin may also be marked with the Standard Mark.

NOTE — The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

APPENDIX A

(*Clauses* 0.3, 2.1, 2.2 *and* 6.1)

DETAILS OF CONSTRUCTION OF FOUNDATIONS AND ASSEMBLY OF FLAT AND HOPPER-BOTTOM BINS

A-1. PREFABRICATED STEEL ELEVATED BASE FOR FLAT-BOTTOM BIN

A-1.1 Prefabricated Steel Elevated Base — Alternatively when the bin is to be mounted on a prefabricated steel elevated base rather than on a brick masonry/cement concrete base it should be fabricated by using different sizes of structural steel as shown in Fig. 3.

A-1.1.1 The details of the columns, trusses and bottom plate should be as follows:

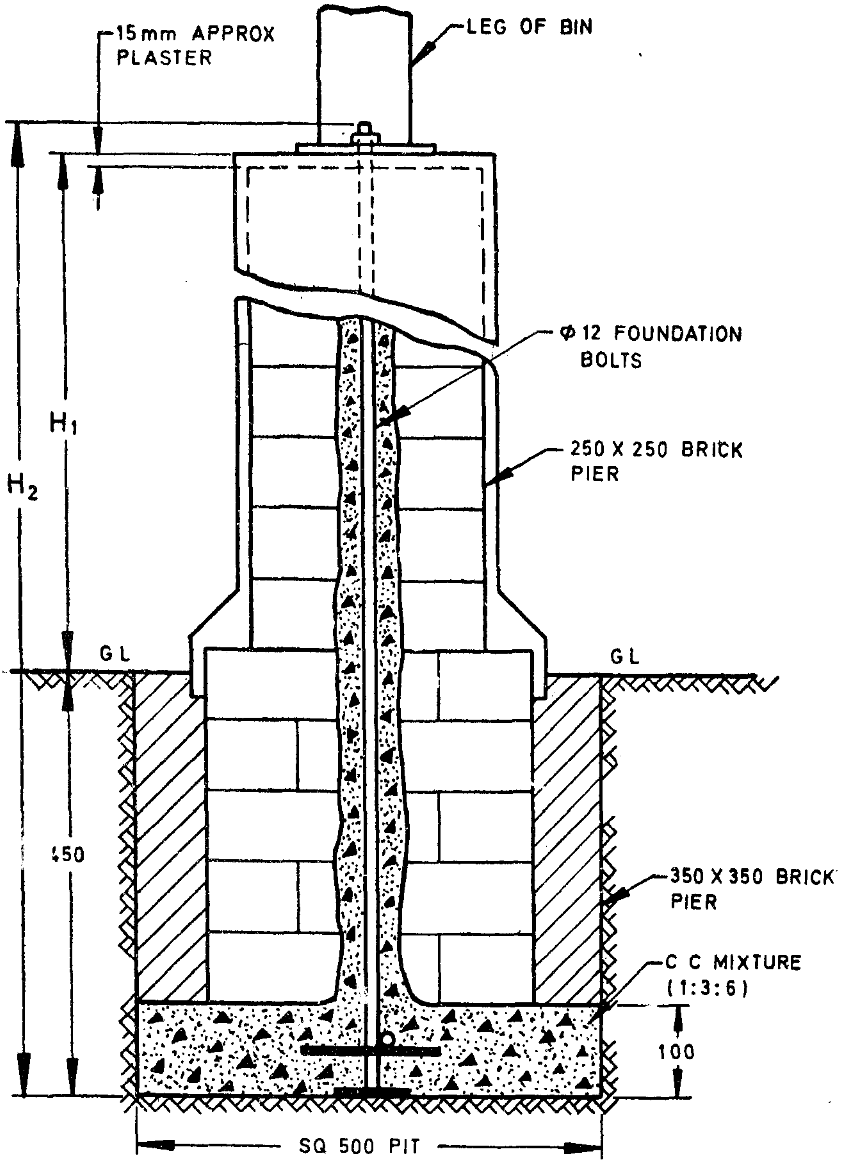
a) *Columns* — The columns should be made from 3 mm mild steel plate and should be of 875 mm length and 135 mm width.

b) *Trusses* — The trusses should be made of 50 × 4 mm mild steel flats and mild steel rods of 12 mm diameter.

c) *Bottom plate* — The bottom plate shall be of 215 mm thick galvanized plain sheet.

A-2. BRICK MASONRY COLUMNS FOR HOPPER-BOTTOM BINS

A-2.1 The details of construction of brick masonry column for hopper-bottom bin are shown in Fig. 3. Five columns are required for bins of all capacities.



All dimensions in millimetres.

FIG. 3 BRICK MASONRY COLUMN FOR OUTDOOR HOPPER-BOTTOM Aluminium Bin

A-3. LOCATION AND ASSEMBLY

A-3.1 The site for the bins should be so selected that the ground is free from floods and proper drainage arrangements are made to prevent water logging near the bins.

A-3.2 Wall Assembly — The wall panels should be joined one by one to the ring by using specific sizes of galvanized or aluminium bolts, nuts and washers (plain and fibre). The wall panels should also be joined together by bolts, nuts and washers. The cotton cord of 6 mm dia coated with white stiff paint should be provided in the groove of each panel joint to make the joint air- and water-tight. The aluminium wall stiffeners should be provided at five respective positions of the wall panels. The top and intermediate rings should be at their respective position.

A-3.3 Roof Assembly — All the ten roof panels and roof stiffeners should be joined together with bolts, nuts and washers to form the conical roof. The inlet with minimum dia of 450 mm should be either at the centre or side of the roof with locking and sealing arrangement. The panel joints should be sealed by providing cotton cord and white stiff paint (*Safaida*) in the grooves. Then the assembled roof is mounted on the top of the bin and joined with bolts and nuts against the top ring.

A-3.4 Legs — In case of elevated base fine prefabricated steel legs should be joined to the bin at their respective position, to keep the floor of the bin elevated above the ground level. The entire structure should then be mounted over the foundation bolts embedded in cement concrete foundation as shown in Fig. 1. Similarly in case of hopper-bottom bin the required number of prefabricated steel legs should be joined to the bin wall at their respective positions.

A-3.5 Hopper Assembly — In the case of hopper bottom bin the 5 hopper panels and hopper stiffeners should be joined together with bolts, nuts and washers against the bottom ring so as to form the conical hopper. The spout with its flange should be provided at the bottom of the hopper at the desired position and joined by bolts, nuts and washers. The hopper angle is of 35° and 45° to facilitate the emptying of bins for different commodities like wheat, paddy and maize conveniently.

INDIAN STANDARDS

ON

STORAGE STRUCTURES AND STORAGE MANAGEMENT

IS:

607-1971	Code of practice for construction of bagged storage structures (*second revision*)
3453-1966	Code of practice for construction of hexagonal type concrete-cum-masonry bins bulk storage of foodgrains
3503 (Part I)-1969	General requirements for silos for grain storage: Part I Constructional requirements
3503 (Part II)-1969	General requirements for silos for grain storage: Part II Grain handling equipment and accessories
5606-1970	Steel bins for grain storage
5826-1970	Constructional requirements for flat storage structures for grain (capacity above 200 tonnes)
6151 (Part I)-1971	Storage management code: Part I Terminology
6151 (Part II)-1971	Storage management code: Part II General care in handling and storage of agricultural produce and inputs
6151 (Part III)-1976	Storage management code: Part III Specific care in handling and storage of agriculture produce and inputs
6201-1971	Constructional requirements for flat storage structures for grains (100 to 200 tonnes capacity)
6883-1972	Method for determination of angle of repose of grains
7147 (Part I)-1973	Steel bins for domestic storage: Part I *GHARELU KOTHI*
7247	Code of practice for fumigation of agricultural produce:
7247 (Part I)-1973	Methyl bromide
7247 (Part II)-1973	Ethylene dibromide
7247 (Part III)-1973	Aluminium phosphate
7247 (Part IV)-1975	Ethylene dichloride and carbon tetrachloride mixture
7715-1975	Methods for testing suitability of bins for safe storage of foodgrains
7716-1975	Method for testing efficacy of fumigation for disinfestation of grains in domestic bins
8455-1977	Code of practice for construction of polyethylene embedded bins for bulk storage of foodgrains

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